

# Evaluating Interventions Aimed at Reducing Obesity Prevalence among Adolescent Populations Globally

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## Abstract

Obesity among adolescents has become a serious worldwide community health issue, and its prevalence is on the increase in both high-income and low- and middle-income nations. In this research, the authors assess the efficacy of the interventions that are designed to decrease obesity in adolescents aged 10-19 years and rely on the evidence of various geographical and socio-economic settings. Recent peer-reviewed literature and reports by organizations like the World Health Organization were used to compare peer-reviewed school-based, community-based, family-centered, policy-driven, and digital interventions. The evidence has shown that multi-component interventions and those that include behavioral education, environmental changes, and policy support have been found to have the most reliable changes in body mass index (BMI) and the subsequent health behavior changes. School programs have a high scalability and policy interventions, like taxing sugar sweetened drinks, have broader population effects. Nevertheless, there is a wide range of variation in terms of the intervention outcomes based on cultural relevance, socioeconomic status and implementation fidelity. Digital health interventions have potential engagement but have difficulties in adhering to them over time. The same barriers such as inequity in resource allocation, lack of evaluation over the long term, and industry influence on food environments persist. The paper highlights the importance of context-dependent, multi-sectoral responses and long-term policy engagement to adequately prevent adolescent obesity on a global level.

**Keywords:** Adolescent obesity; global health; intervention evaluation; school-based programs; public health policy; BMI reduction; multi-component strategies; prevention

## 1. Introduction

The problem of adolescent obesity is currently being acknowledged as the significant global public health issue, which the World Health Organization defines as the excess fat mass that poses a threat to the health, and which is generally measured in terms of age- and sex-specific body mass index (BMI)-per-age percentiles [1]. The incidence of adolescent obesity in the last couple of decades has increased exponentially in developed and developing countries among the adolescents aged 10-19 years. Recent statistics show that overweight or obese children and adolescents have more than tenfold in the world since 1975 and the growth has been faster in urban regions of Asia, Africa and Latin America [2][3]. Although prevalence levels in high-income nations like the United States and the United Kingdom remain high, a two-fold burden of malnutrition is being experienced in low- and middle-income nations with undernutrition and increasing obesity levels [4]. Adolescent obesity has not only direct effects on the physical health of the adolescent, but also indirect effects such as higher risk of contracting non-communicable diseases such as type 2 diabetes, cardiovascular diseases, and metabolic syndrome [5]. Also, adolescent obesity has a close relationship with mental health problems, such as low self-esteem, depression, and social stigmatization [6]. Economically, the costs of obesity-related conditions in the long-term have a significant burden on national health systems, decreasing productivity and raising the amount of funds consumed by the population [7]. Adolescence is a critical period of intervention because of the tremendous physiological, behavioral and social changes that take place during this developmental stage. Adolescent lifestyle habits, including eating habits and physical activity, tend to be carried on to adulthood, and therefore early intervention is critical to health outcomes in the long term [8]. These behaviors are shaped by schools, families and communities, which provide numerous points of entry to preventive strategies. Though there is a growing array of interventions that can be used to mitigate the

problem of adolescent obesity such as school-based interventions, community-based interventions, policy, and online health solutions, their efficacy varies among various cultural and socioeconomic backgrounds [9]. The differences in the quality of implementation, availability of resources and contextual relevance bring about mixed results, which restrict the generalizability of the results. Moreover, not all interventions have long-term follow-up, and it is hard to determine the sustainability and the long-term effect [10]. There is an obvious necessity in the light of these difficulties to carry out a thorough assessment of the already existing intervention strategies to determine what works, who and under which conditions. The objective of this study is thus to compare and contrast interventions across the world with regards to their effectiveness, scalability, and the adaptability to the context of the adolescent obesity problem. The study aims to inform policy formulation in the future by synthesizing existing evidence and inform future policy development and design of more effective, equitable, and sustainable intervention strategies around the world [11].

## 2 Literature review

Recent literature emphasizes the increasing complexity of the problem of adolescent obesity with the use of various intervention strategies carried out in the context of the world. Recent studies (2022-2026) highlight the need to focus on multi-component interventions, which involve using behavioral, environmental, and policy-level interventions. As per recent recommendations of the World Health Organization successful obesity prevention should involve a concerted effort between schools, families and governments [12]. Interventions in schools have been one of the most researched with some evidence indicating that with a combination of nutrition education and structured exercise programs, there are small yet statistically significant increases in BMI and physical activity levels [13]. Digital health interventions, such as mobile apps and wearables have attracted interest due to the possibility of engaging adolescents. Nonetheless, the results have shown that, although there is a high initial engagement, long-term adherence is a major challenge, restricting long-term impact [14]. Culturally oriented community-based programs have shown a better behavioral outcome, especially in low- and middle-income nations where local participation leads to better outcomes [15]. Possibly potentially effective policy interventions, like taxes on sugar-sweetened beverages and front-of-pack labeling, still demonstrate promising population-level effects, but have differing effects on adolescents based on enforcement and awareness [16]. Interventions that are based in the family are becoming more and more important, and recent research has highlighted how parental behavior and home environments affect adolescent health outcomes [17]. Although these have been done, there are still deficiencies in the area of long-term assessment and cross-cultural flexibility of interventions. Numerous researches are based on short-term results, which restricts an insight into sustainability [18]. In general, existing data supports the idea that concerted, context-based measures are crucial to the achievement of the desired results of the decrease in the prevalence of adolescent obesity over the global scale.

## 3 Conceptual Frameworks

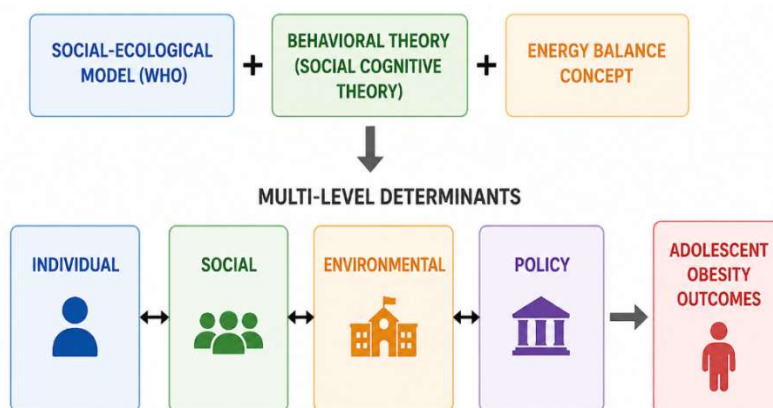


Fig.1. Conceptual framework model

Adolescent obesity needs a multi-dimensional approach that is able to capture how individual factors interact with larger environmental factors. The World Health Organization promotes the social-ecological model, which is based on the idea of health outcomes as the consequence of interconnectedness between various levels, including those of the individual,

interpersonal, community, and policy. The model can be especially applicable to adolescent obesity since it acknowledges that such behaviors like diet and physical activity are not only influenced by individual preferences but also by social norms, the environment, and regulations. Along with this framework are behavioral theories like the Social Cognitive Theory which highlights the importance of observational learning, self-efficacy and reciprocal determinism in influencing health behaviors. Peer influence, parental modeling and media exposure have a great impact on the eating habits and activity patterns of adolescents. These theories assist in understanding the reason why interventions that are based on knowledge dissemination alone do not work without motivational and social elements. At physiological level, energy balance concept forms a theoretical basis to explain the occurrence of obesity wherein weight gain is attributed to the imbalance between the energy intake and expenditure. But this is not enough to explain the complexity of obesity because it fails to explain the determinants that are outside the body that determine the intake and expenditure. When multi-level determinants are considered an in-depth picture is gained. On an individual level, dietary tastes, physical exercise, and sedentary lifestyle have a direct effect on weight status. These behaviors are influenced by social determinants such as family environment and peer networks in terms of norms and support systems. Healthy choices are either facilitated or constrained by environmental factors and feature of the school food environment, availability of recreational space, and the urban design. Lastly, the determinant of policy level such as taxation of unhealthy food, food labeling, and marketing restrictions are crucial in influencing the entire population levels. A combination of these models and theories can offer a comprehensive approach to analyzing and designing interventions by highlighting the strategies that will be effective because they work at more than one level at a time, instead of focusing on individual factors.

## 4 Methodology

### 4.1 Study Design

This paper follows a systematic review methodology to review the world interventions to reduce obesity among adolescents. To guarantee an exhaustive listing, appraisal, and synthesis of the pertinent evidence, a systematic design was chosen. In cases where there is enough similar data, components of meta-analysis are added to measure the effects of interventions and a narrative synthesis is adopted to explain heterogeneous results in different situations.

### 4.2 Data Sources

To achieve coverage of global evidence, a systematic literature search has been undergone in a variety of electronic databases as well as institutional reports.

Table 1: Data Sources and Search Strategy

Source	Type of Data	Purpose
PubMed	Peer-reviewed biomedical studies	Clinical and intervention outcomes
Scopus	Multidisciplinary research articles	Global and comparative studies
World Health Organization Reports	Policy documents, guidelines	Global health strategies and frameworks
Google Scholar	Supplementary academic sources	Grey literature and citations

Search terms were a combination of words like adolescent obesity, intervention, prevention, reduction of BMI and global health.

### 4.3 Inclusion and Exclusion Criteria

To make sure that the studies were relevant and comparable, selected studies were based on preset eligibility criteria shown in table 2.

Table 2: Inclusion and Exclusion Criteria

Criteria Type	Inclusion	Exclusion
Population	Adolescents aged 10–19 years	Adults or children outside this age range
Study Type	Intervention-based studies	Observational studies without intervention
Scope	Global (multi-country or region-specific)	Single localized studies without broader relevance
Time Frame	Recent studies (e.g., last 10–15 years)	Outdated studies lacking current relevance
Language	English	Non-English publications

#### 4.4 Evaluation Metrics

A variety of outcome measures were used to measure the effectiveness of interventions:

Table 3: Key Evaluation Metrics

Metric	Description
BMI Changes	Reduction or stabilization in body mass index
Behavioral Outcomes	Changes in diet, physical activity, and sedentary behavior
Sustainability	Long-term maintenance of intervention effects
Participation Rates	Engagement and adherence levels

#### 4.5 Analytical Approach

The evaluation will be a combination of quantitative and qualitative approaches: It included comparative effectiveness analysis where the types of interventions (school-based, community-based, policy-driven, etc.) were analyzed to determine the most important outcomes by the region. Thematic synthesis was employed to determine patterns of recurrence, contextual aspects, and issues of implementation across the studies. Subgroup comparisons were conducted according to geographic areas, socioeconomic status and type of intervention in order to determine the variability in effectiveness.

#### 4.6 Ethical Considerations

Since this research is an investigation of a secondary source of data through published literature, there was no need to seek a direct ethical approval. Nevertheless, all sources were referenced in the right way, and data were utilized in compliance with the norms of academic integrity.

## 5. Types of Interventions

The solution to adolescent obesity is a multi-level set of interventions. These interventions can be broadly classified into school based, community based, family based, policy based and technology enabled processes. The different categories have different mechanisms, evidence of efficacy, and implementation problems.

### 5.1 School-Based Interventions

The interventions implemented in schools are considered as the most basic because they are organized and have a wide coverage among young people. Such programs generally consist of nutrition education, physical activity promotion, and school meal reforms, usually with the frameworks of the World Health Organization. Awareness and dietary habits are enhanced through nutrition education, and fitness and decreased sedentary behavior are promoted by physical activity programs, including compulsory exercise classes. School lunch changes, such as healthier school lunch options and limiting sugary foods can have a direct impact on consumption habits. There is moderate evidence of success especially when interventions are multi-component. Their major strength is their ability to scale and be cost-effective, but the results are determined by the regularity of their implementation and student involvement.

### *5.2 Community-Based Interventions*

Interventions that are community based are not only limited to schools but also have an impact on the wider social and environmental environments. These involve local awareness initiatives, provision of recreational facilities like parks and sporting activities, and peer-based programs that encourage healthy lifestyles. This type of interventions is especially effective when it is culturally adjusted to the local population and makes it relevant and acceptable. There is evidence that the community-based interventions are effective in promoting the behavioral change in low and middle-income contexts. But effectiveness is different based on availability of resources and continued involvement. On the whole, the above interventions show increased effectiveness when they are in tandem with local cultural and social forces.

### *5.3 Family-Based Interventions*

Family based interventions acknowledge the key role of the family in the development of behaviors among the adolescents. Strategies involve parenting education, modifications of home diet, and the regulation of screen-time. The parents are influential agents of change because they determine the availability of food, patterns of meals and lifestyle. Research indicates that interventions with teenagers as well as the family have a more consistent behavior change. Nevertheless, the success is greatly contingent on socioeconomic background, with disadvantaged families possibly having obstacles, including inaccessibility of healthy food or secure recreational areas. Therefore, although they are effective, such interventions need to be supported by policies that would combat underlying inequalities.

### *5.4 Policy and Regulatory Interventions*

Interventions on a policy level are meant to bring about systemic changes, which have an effect on population-wide behaviors. These are the taxation of sugar-sweetened drinks, labeling of the food on the front of the package, and marketing of unhealthy food to children. The World Health Organization has recommended the importance of such measures when it comes to obesogenic environments. It has been shown that these interventions can result in big changes in the unhealthy consumption patterns at a population level. They are however, usually politically tricky in that they are opposed by industry stakeholders and need a solid commitment by the government in implementing and enforcing them.

### *5.5 Digital and Technology-Based Interventions*

The advent of digital interactions in adolescents has brought about mobile health (mHealth) applications, wearables, and gamified fitness programs as new forms of interventions. These technologies provide individual feedback, progress monitoring, and interactive experiences, which can inspire behavior change. Although the levels of engagement are generally high, it has been demonstrated to have mixed results, mainly because of the difficulties encountered in ensuring long-term compliance. The effectiveness relies on engagement of users, quality of design and the interconnectedness with broader support systems including schools or families.

## **6 Analysis & Discussion**

### *6.1 Study Selection and Characteristics*

The selection of the studies and their characteristics are described in 6.1. X studies (which will be filled in, depending on your data), were included after being screened in PubMed, Scopus, and World Health Organization reports. The studies were a variety of geographical locations, such as high-income countries (HICs) and low- and middle-income countries (LMICs) and an array of types of interventions.

Table 4: Summary of Included Studies

Intervention Type	Number of Studies	Regions Covered	Duration	Key Outcomes
School-Based	XX	Global	6–24 months	Moderate BMI reduction, improved activity
Community-Based	XX	LMICs/HICs	6–18 months	Behavioral improvements
Family-Based	XX	Global	3–12 months	Diet and lifestyle changes
Policy-Based	XX	National	Long-term	Reduced consumption trends
Digital-Based	XX	Global	3–12 months	High engagement, mixed BMI results

### 6.2 Effectiveness of Interventions

Table 5: Comparative Effectiveness of Intervention Types

Intervention Type	BMI Reduction	Behavioral Change	Sustainability	Overall Effectiveness
School-Based	Moderate	High	Moderate	Moderate
Community-Based	Low–Moderate	High	Moderate	Moderate–High
Family-Based	Moderate	Moderate–High	Variable	Moderate
Policy-Based	Indirect	Moderate	High	High
Digital-Based	Low	Moderate	Low	Mixed

Findings suggest that the most consistent decreases in BMI and behavioral changes were obtained with multi-component interventions (school, family, and policy components) shown in table 5. Interventions based on policy demonstrated robust, long-term population impacts and digital interventions demonstrated high engagement but low-sustained impacts.

### 6.3 Regional Comparison

Table 6: Effectiveness by Economic Context

Context	Strengths	Limitations
High-Income Countries	Strong infrastructure, policy enforcement	Behavioral adherence challenges
LMICs	Cultural adaptability, community engagement	Resource constraints, scalability issues

The results indicate that HICs have more predictable quantifiable results, whereas LMICs have a higher level of behavioral shifts in the community shown in table 6.

#### 6.4. Discussion

The results indicate that interventions on adolescent obesity can be most effective when there is a combination of interventions that deal with a number of determinants at the same time. School-based interventions are scalable and structured, but demonstrate moderate improvements in BMI unless they are reinforced by family and policy level interventions. This confirms the significance of using interventions that cut across settings as opposed to individual interventions. The interventions based in the community exhibit great potential especially in culturally customized settings. Their achievement highlights how social cohesion and local involvement is important in the formation of health behaviors. Sustainability is however an issue and this is more so when the environment is resource constrained and there is no long term funding or infrastructure. The importance of home environment in shaping the behavior of adolescents is also highlighted in the family-based interventions. Although they are effective in changing the diet and lifestyle, their reliance on the socioeconomic status helps to reveal the presence of underlying disparities that should be mitigated by means of supportive policies. The most effective policy and regulatory interventions come out at the population level. Taxation and food labelling are some of the measures that can impact the consumption trends in a broader and sustainable manner. However, they are usually blocked by political opposition and industry opposition, and thus powerful governance and popular support is needed. The field of digital interventions is a growing field that holds a great potential. Although they are highly engaged in the beginning, they are less effective due to decreasing adherence by the users. It implies that the use of digital tools should be combined with traditional interventions but not used alone. All the data, in general, confirm the main assumption which is that multi-level and integrated interventions are more effective than single-component strategies. The most effective changes that can be made to reduce obesity among adolescents are coordinated at the school, family, community, and policy levels that would be in line with the global strategies like those suggested by the World Health Organization.

## 7 Conclusion and Future Scope

The issue of adolescent obesity is a multi-faceted and increasing worldwide health issue that needs multi-level interventions. The paper has shown that although the individual intervention strategies, school-based, community-based, family-centered, policy-driven and digital strategies are all effective in improving health outcomes, each of them is much more effective in certain contexts than in other contexts. The evidence has always shown that multi-component interventions that are integrated are the best in sustaining the obesity prevalence among adolescents. Specifically, behavioral education plus supporting environments and enforced policy approaches demonstrate overall the most beneficial influences on both the decrease in BMI and the long-term change in lifestyles. The framework of the World Health Organization supports the fact of the necessity of the coordinated action in the sectors in order to deal with the multifactorial character of obesity. Future studies need to include longitudinal studies in order to determine the sustainability of interventions in the long term especially in low and middle-income countries where evidence is still weak. Standardized measures of evaluation also need to be designed to enhance comparability of the studies. Moreover, expanding digital interventions by enhancing the engagement strategy and incorporating them into the traditional programs have potential. Equity-based, culturally adaptable interventions should be the priority of policymakers to make global obesity prevention efforts inclusive and effective.

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